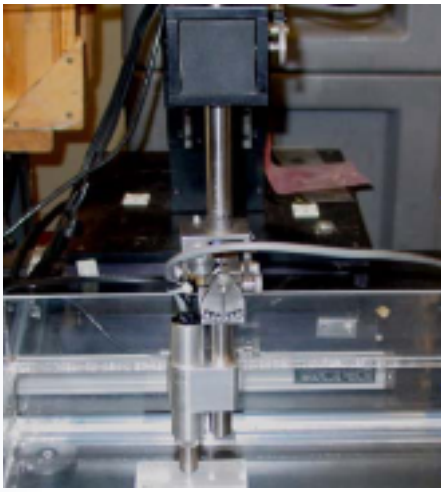
DeepFocus Acoustic Microscope Transducer

INL inventors Steve Taylor and Nancy Kraft have developed a new ultrasonic immersion transducer named the DeepFocus Acoustic Microscope Transducer with Integrated Pulser-Receiver.

Ultrasonic transducers are routinely used for nondestructive testing and material characterization. The DeepFocus Acoustic Microscope Transducer with Integrated Pulser-Receiver is a novel design and improves upon all ultrasonic testing equipment in the following ways:

- Precise characterization of material dimensions as small as 0.005 in. diameter at 0.005 in. depth.
- The focused depth of field of the Acoustic Microscope is over 60 times greater than other ultrasonic transducers.
- Value is realized from the technology's ability to characterize material more accurately, in less time and at less cost.



Description

Immersion ultrasonic transducers are used for nondestructive testing and material characterization on a wide range of materials and in a multitude of industries.

Current ultrasonic technologies require users to choose between sensitivity and resolution and they are extremely large, and have a short depth of field. The DeepFocus Acoustic Microscope Transducer with Integrated Pulser-Receiver has high resolution, is extremely sensitive and compact and has a depth of field that allows it to remain in focus over 0.4 in. of water path variability. This system will detect fill voids, cracks, delaminations and other surface and subsurface anomalies, and provide precision flaw location. Possible applications of this technology include:

- A variety of corrosion inspection applications,
- Industrial coating tests,
- Medical industry applications,
- Aircraft safety,
- Computer chip inspection, and
- Semiconductor industry use.

Material Characterization

Nondestructive material characterization and flaw detection are the principal applications of this technology. The Acoustic Microscope's ability to detect, characterize, and precisely represent locations of subsurface anomalies is superb. Characterized material

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dimensions are as small as 0.005 in. deep and 0.005 in. diameter – smaller than a human hair. The design of the DeepFocus Acoustic Microscope Transducer with Integrated Pulser-Receiver provides extremely fast rise and fall times of the ultrasonic signal. The rapid ultrasonic signal recovery gives the Acoustic Microscope the ability to separate signals produced by the sound wave traveling through different media. A greater ability to separate and interpret signals gives the Acoustic Microscope extremely high resolution.

Depth of Field

Depth of field is a measurement of the range over which a transducer remains in focus. Ultrasonic transducers must be focused in a manner similar to that of a standard camera, with objects at a particular distance being in focus, and objects either in front of or behind those objects are out of focus. For example, if objects located from 1 to 15 ft. away are out of focus, objects from 15 ft. to 20 ft. are in focus, and all objects beyond 20 ft. are again out of focus, the camera's depth of field is 5 ft. Most current ultrasonic transducer technologies have a limited depth of field of approximately 0.004 in. of aluminum, needing greater than 60 test-passes with the microscope refocused each time to inspect and characterize 0.250 in. of material. The Acoustic Microscope's depth of field in aluminum is 0.250 in. The increased depth of field allows characterization on the same amount of material in one test pass.

Value Added

The new equipment design is up to fifteen times lighter than current technology. The equipment is also significantly cheaper than other ultrasonic immersion testing equipment. Value is quickly realized from more affordable units, less time spent focusing and retesting areas, and more precise characterization with higher resolution. Material is characterized more accurately, in less time and at less cost.

For more information

Licensing

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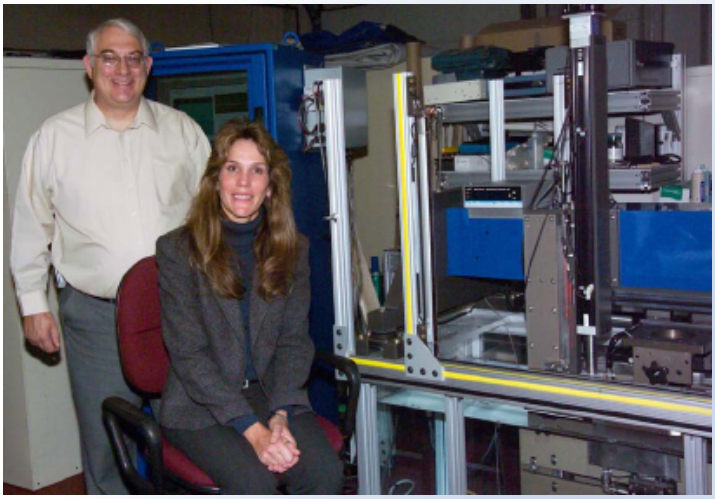
INL is a U.S. Department of Energy national laboratory operated by Battelle Energy Alliance



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